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Gas Journal

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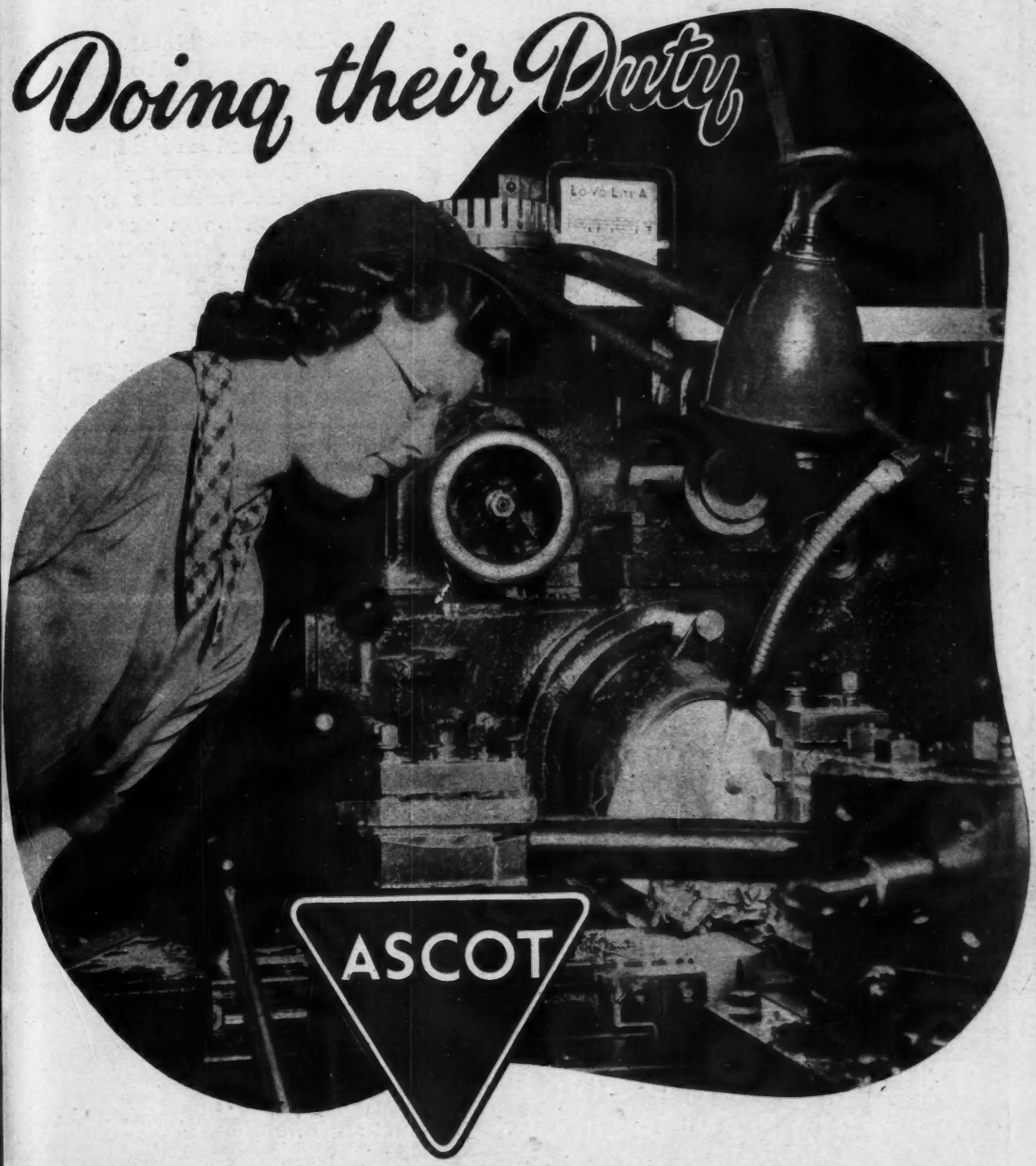

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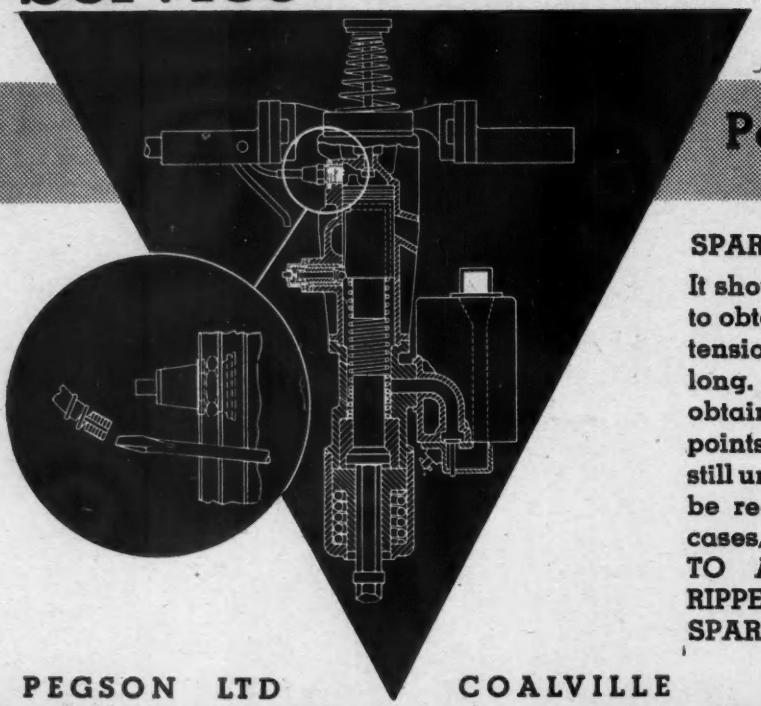

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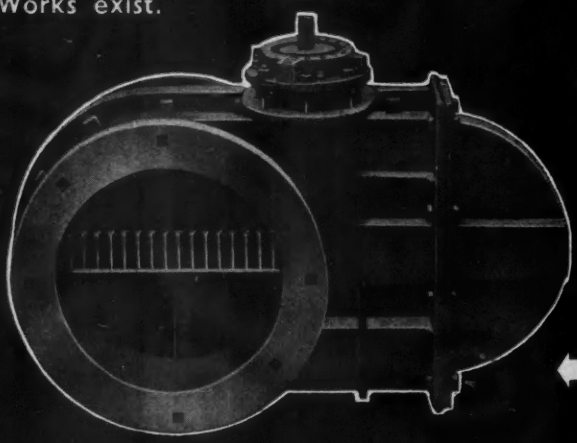

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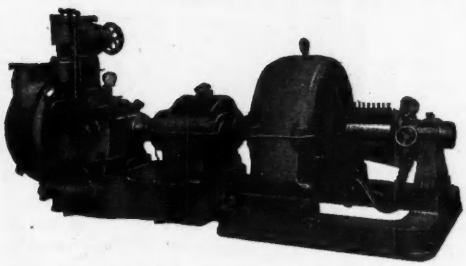

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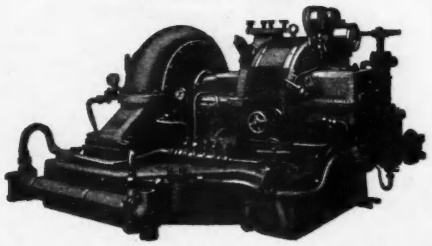

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GAS JOURNAL, MAR. 17, 1943

VOL. 241 95th YEAR No. 4165

EDITORIAL NOTES

WHERE DO WE STAND?

ANNOUNCING the resignation of Dr. E. W. Smith from the Directorate of Gas Supply a fortnight ago, we purposely refrained from commenting on the matter in any detail. It appeared to us just one of those cases, surrounded by elements of surprise and mystery, in which perhaps calm reflection and second thoughts might well avoid the irrevocable spoken word perhaps regretted later, and that in any case an official announcement might provide substantial matter with which to agree or quarrel. For this attitude we have been warmly commended by many whose judgment we esteem very highly, who like ourselves desire nothing so much as to see Dr. Smith resume public activities in some shape or form on behalf of the Industry at the earliest possible moment, and who, like ourselves, believe that the best chance of this lies in the avoidance of crises. However, others have not taken this view, and rights and wrongs, achievements and prospects, are being eagerly discussed in all quarters, including daily Press interviews. We still await an official announcement which, when it comes, may or may not reveal whether the Directorate is to be continued, and if so in what form and under whose guidance, but is most unlikely to disclose all the circumstances which led Dr. Smith to the conclusion that he could no longer be of genuine service either to the country or to the Gas Industry in his position under the Ministry of Fuel. Whether in reality this fact was due to conditions within that Ministry (the Directorate, it must be remembered, was formed under the Board of Trade), or to lack of co-operation on the part of a politically strong, even if numerically weak, minority within the Industry, Dr. Smith's decision was obviously a right one. The great majority of the Industry, at all events, had faith in his power to help it, and if that power was being thwarted by hidden influences of whatever kind, it would clearly have been most unhelpful to attempt to conceal the fact. There is a widespread feeling that the sands are running out, and now at least it is clear that for the time being Dr. Smith's representation of gas interests will be lacking. There may be another Director of Gas Supply, but the great majority had unfalteringly pinned their faith to this particular personality and his very understanding "team." When we talk of gas interests, it is with the firm conviction that they are synonymous with national interests, so long as they are guided with knowledge and understanding along right channels.

Unfortunately consideration of the affair cannot possibly be divorced from the general situation confronting the Gas Industry. It is now eighteen months at least since Dr. Smith interpreted not only the general desire within for reorganization and a plan for our future place in the national fuel industry, but the very definite opinion in Government circles that, if we could not unite to produce an agreed and acceptable plan, one would have to be found for us, and it might not be entirely to our liking. And where do we stand to-day? Our own headquarters decided, with general concurrence, that our own internal organization must be reshaped before anything like an agreed plan could be put forward—before, indeed, there could be any body capable of speaking for, or negotiating on behalf of, the Industry as a whole. After all these months of intensive thought, we seem to be as far removed as ever from agreement on even this preliminary stage; in other words, we remain a disunited collection of heterogeneous elements at a time of threatening crisis which demands joint action as never before. In the meantime, we have a Post-war Planning Committee in session, working on various lines of enquiry through sub-committees. Little is heard of its work, which is probably very useful, but in default of any agreed authority of the Gas Industry to accept their recommendations or otherwise, and to put them forward if accepted, there would appear to be no great hurry for the completion of their deliberations. And so we jog along towards the threatened imposition of a plan upon us, having in the meantime seen Dr. E. W. Smith retire from the position where there appeared to have been added to his undoubted qualifications such official standing as would ensure due recognition of the Industry's capabilities.

It is not surprising, therefore, that uneasiness—almost fear about the future—exists at the present moment, heightened by the fact that meanwhile other fuel industries have been enjoying no little publicity for various schemes which would seem to intimate that they at least have a plan for the future, the while women's organizations have been passing fatuous resolutions, such as that in the post-war period the "gas age should be bypassed" in favour of the direct universal adoption of electricity. Elementary, no doubt; but there is little to indicate to the unthinking public that the Gas Industry has any alternative to offer to such by-passing, or even has any very rooted objection to it.

The cause of the eternal schism in the Industry's internal affairs is well enough known. We do not presume to judge whether "London" influences (as they are commonly called) should or should not have the control which, as the "rest" maintain, they try to exercise in national affairs, nor whether, as "London" would probably argue, such attempted control is merely a figment of the "rest's" imagination. Be that as it may, and much as we dislike public linen washing, it is a rift of such long standing and common knowledge, and an obstacle to progress of such apparent impenetrability, that it is as well to put it into words and face it squarely at this critical stage of our affairs. Unfortunately we are compelled to go so far as to believe that no solution of the problem is attainable within a period which might be regarded as reasonable in respect of the production of an agreed plan for the Gas Industry's future. It would therefore seem to be in the best interests of all parties to the disagreement to agree in asking for an impartial enquiry of some kind, where the opinions could be gathered and analysed of owners of all types, consumers, and all the complex elements which are interested in a continuation of gas supply. The case for ensuring the future prosperity of our Industry, as by far the

most important coal-processing industry in the country, is so strong that we ought really to have no misgivings about it. Yet there are grave fears among the most knowledgeable and observant that, failing early decisive action, our future may be determined for us by those who, through lack of real understanding of our capabilities, are even prejudiced to some extent against us. Whether or not facilities for such an enquiry could be granted at this juncture we do not know, but it would afford to the holders of all shades of opinion perhaps the last opportunity of voicing their views with any prospect of consideration.

AT THE MINISTRY

AFTER writing the above survey of the situation as it appears to us, there came the announcement that, consequent on the resignation of Dr. E. W. Smith, the Minister of Fuel and Power has appointed Mr. George Evetts as Gas Adviser to the Ministry. Exactly the significance of the change from a Director to an Adviser we cannot, of course, estimate, but we derive great comfort from the fact that Mr. Evetts has seen his way to accepting the appointment. His vast knowledge of the Gas Industry, both administrative and technical, fits him as few other men to carry the confidence which the Industry undoubtedly reposes in his judgment, and the fact that, from the inception of the Directorate, he was a member of Dr. Smith's "team," seems to offer hope of a continuity of thought and action which it was feared might be broken.

In the same announcement the Minister states that, in order to ensure the closest co-operation between the Ministry and the Gas Industry, he is in consultation with the President of the National Gas Council, Sir David Milne-Watson, and the President of The Institution of Gas Engineers, Mr. E. V. Evans.

It is a delicate matter upon which to comment, but we know Mr. Evans well enough to be certain that he will read no "personalities" into anything we may say. It is as President of the Institution that he is being called into consultation, and nothing is more natural than that the Institution President should be called in. It is purely fortuitous that this year's President happens to be the chief executive officer of one of the big London undertakings. Mr. Evans has always shown himself a man of wide vision, and particularly during his year of office has he assiduously toured the District Associations in a crusading spirit far divorced from the parochialism even of London. Yet, with full knowledge of the "feeling" to which we referred in our previous Editorial, he might well consider himself in a less equivocal position and relieved of a heavy responsibility if the Minister saw fit to add to his panel of consultants an indisputably direct representative of extra-London thought. There are many whom the Provinces would regard as fully capable of presenting their particular problems. They would certainly not wish their present I.G.E. President to be *replaced* in the capacity of consultant to the Minister; as such he has a definite function to perform. It is an *addition* we are suggesting, which would most certainly make for satisfaction and harmony—and, consequently, efficiency.

AN ESSENTIAL PROCESS

IN view of the state of seeming uncertainty which we have discussed, expressions by the chairmen at the annual meetings of the Gas Light and Coke Company and the South Metropolitan Gas Company last week—reports of which will be found on later pages—may strike some as merely pious hopes, savouring of optimism amid muddle. Chief among the sentiments, we think, was the idea of "a national fuel policy overriding the interests of particular sections" (*vide* Sir David Milne-Watson's address)—a policy which the Ministry of Fuel and Power could, if it thought fit, prepare for now. It is not only the Gas Industry which looks forward to the fulfilment of that hope, which was voiced also by the President of the South Metropolitan Gas Company. We are certain that very many fuel technologists who are thinking in terms of the national interest look to the day when each form of fuel and energy will have its appropriate place, the one complementary to the others.

We have already suggested that in high quarters—in Government departments—there exists the scantiest of knowledge about the Gas Industry's national functions in such a commonsense scheme based on coal conservation. Its services, we think, are regarded casually because the Industry has no authoritative channel through which the common voice of all its members can be clearly heard. The Industry is inept in putting forward its case for legitimate and necessary consideration. Perhaps it is that we talk about unity knowing that unity within the Industry does not exist; perhaps we talk about post-war plans the more, knowing that our plans are ill-defined and vague and far from unified. In the past there has been much talk about the absence of any authority to prevent the reckless and extravagant competition which resulted in so many instances pre-war in the use of fuel uneconomically from the point of view of both the nation and the user. There has been advocacy of the single authority in control. There now is this single authority, the Ministry of Fuel and Power, with the various fuel interests (including, of course, electricity) under the one umbrella. We only hope that this umbrella will not be used to obscure the sun of development from any one of them—as far as the Gas Industry is concerned, because it cannot effect agreement within itself. The situation so obviously demands absence of rifts within the lute.

It was suggested at both meetings to which we have referred that the Ministry of Fuel has come to stay, and we think the suggestion is not misplaced. But it will not function as it could if it becomes yet another example of civil service procedure acting with full knowledge of this procedure, but in comparative ignorance of the various sections of the fuel industries whose destinies ultimately lie within its control. And how can understanding be reached by an outside body about an industry which is internally at strife and cross purposes and, to put it quite bluntly, because of petty annoyances and grievances and jealousies and all the accompaniments to and paraphernalia of "wheels within wheels" and sectional desire for authority, is floundering uncertainly with no settled mind of what it is about?

Yet we would say once again that the Industry is essential to the national welfare, that it should work to solidify, not corrode, the scientific foundation on which it is based, and build upon this foundation a structure planned with unity of thought.

ORGANIZATION OF CHEMISTS

MANY prominent and eminent chemists, including gas chemists, have, during the past few weeks, become active in an attempt to organize the profession to attain, in their own words, "the unity necessary to enable them to take their fitting place in advancing the good of the community." Collectively they have stated concisely what seems to them the desirable functions of an organization that will truly represent chemists and chemistry. Among these functions are publications for the exchange and dissemination of chemical knowledge; libraries, both central and regional; publicity, to ensure that the general public be accurately informed of what chemists and chemistry are doing and could do for the benefit of the community; and conventions of a type which will "demonstrate to the public the unity of chemists and the importance of chemistry." For the purpose it is believed essential that there should be a common secretariat, a central house, and close co-operation in all centres between all bodies promoting the interests of chemistry and chemists.

As a first step they call upon the Councils of the three chartered bodies—the Chemical Society, the Society of Chemical Industry, and the Institute of Chemistry—to ask the Chemical Council for a report on how to expedite action and to advise whether the agreement constituting the Chemical Council can be amended and extended to enable that Council to function with greater effect as a central organization for co-ordinating all the services now performed for chemistry and for chemists by

various separate and largely independent bodies. If the Chemical Council is found to be so constituted as to make impossible its adequate remodelling, they desire that immediate steps be taken to set up some new Federal Body with a constitution suited to the purpose in view.

It has been suggested that the reason why chemists have not got together in one great institution is that no responsible group has ever been bold enough to insist upon the only policy which can be successful—the complete fusion of the three important organizations. Professor M. W. Travers thinks it can be done, and in *Chemistry and Industry* of March 6 he referred to the Institute of Fuel as providing some sort of example. He recalled that some years ago two institutions came into being —the Institute of Fuel Technology and the Institution of Fuel Economy Engineers. Each body approached the other with a view to finding a *modus vivendi*, but nothing resulted. However, each body invited Lord Melchett to be its President. He accepted both invitations, and promptly gave a solution of the problem. He said: "Now, gentlemen, get together, and form one institution. It is quite a simple matter. Each body will call a general meeting, which will approve the principle of fusion, and will instruct its executive to give effect to its decision without delay The executive will appoint a small committee with instructions to formulate an agreed scheme for fusion." His advice was taken. Apparently insurmountable difficulties disappeared when they were faced and the result was completely successful. The problem before the chemical organizations is relatively large compared with the one which is the subject of this note, but relatively small compared with those with which Lord Melchett once dealt so successfully. There are obstacles such as the revision of Royal Charters to be surmounted but, remarked Professor Travers, they are not insuperable. The first stage would seem to be an obvious one. The second perhaps presents difficulties, but probably only such as could be dealt with by a small committee under an independent chairman of the standing and experience of a High Court judge.

Ministry of Fuel and Power

Last week announcement was made of the resignation from the Directorate of Gas Supply, in addition to Dr. E. W. Smith, of Mr. F. J. Ronca, Mr. George Evetts, and Mr. E. J. Fottrell.

Subsequently the Ministry announced the appointment of Mr. Evetts as Gas Adviser to the Ministry. In order to ensure the closest co-operation between the Ministry and the Gas Industry the Minister is in consultation with the President of the National Gas Council (Sir David Milne-Watson) and the President of The Institution of Gas Engineers (Mr. E. V. Evans).

Letters to the Editor

Proximate Analysis of Coal

DEAR SIR,—Messrs. Brown and Bean in their Paper read before the Institute of Fuel have a soft spot in their hearts for the American Chemical Society's test for volatile matter (platinum crucible in flame) which is shared by many, but they do not think highly of the new British Standard test for volatile matter. They regard the adoption of a temperature of 925° in the B.S. test as a "*major disaster*" and "unacceptable." There are two reasons given, in their refreshingly frank Paper, for their preference—namely, that it will cause a lowering of the value for volatile matter and make some coals fall into the "dreaded 29% class," and that only one test can be done at a time.

The effect of temperature on the volatile matter is exaggerated in the example given by them in Table I, and the value recorded for A at 920° in a silica crucible is obviously wrong, and the high average deviation at 920° should have caused them to repeat the test. If A 920° is ignored, the increase in volatile matter using two silica crucibles at a time is 30.95–31.4 between 920° and 960°, and the volatile matter at 925° in a silica crucible would be 31.0, not 30.7.

If Messrs. Brown and Bean will read Appendix to B.S. 1016 (republished in *Fuel*, 1942, 21, 102) they will see the records of experimental work on which the new B.S. test for volatile matter was devised, and will realize that the standardization of the test was based on rather more thorough work than that they now record.

A British Standard test cannot be influenced by the fact that some gas coal producers wish their volatile matter to be as high as possible, for the value recorded by the test will not influence to the slightest degree the thermal yields of that coal in a gas retort. There are other coal producers who might object that a high temperature for the volatile matter test would make the low volatile coals into medium volatile coals. The dominant factor which must exercise the minds of a committee concerned with a British Standard test for volatile matter must be that the test results must be reproducible in different laboratories, and the test must apply to a wide variety of coals. I have no hesitation in saying that the new B.S. test for volatile matter is, in this respect, greatly superior to that of the American Chemical Society, and even of the U.S. Bureau of Mines test. While Messrs. Brown and Bean and any buyer or seller of coal are at liberty to agree on their own methods for the analysis of coal, and while many early British B.S. methods for the analysis of coal (and particularly for volatile matter) could be justifiably criticized, the present B.S. standards (1016 and 1017) are firmly based on reliable experimental data and should not lightly be termed "unacceptable."

Midland Coke Research Committee, Yours faithfully,
Sheffield University. R. A. MOTT.
March 9, 1943.

The American Gas Industry

DEAR SIR,—In your interesting and complimentary survey of the reports at our last Annual Meeting in your issue of Dec. 9, comment is made that in the natural gas statistical report the figures for house heating are not isolated. It may be that some of your readers do not understand the reason for this. In a number of our natural gas territories, particularly in the South and South-west, where the climate requires only a few days' heating in a year, there are millions of small individual room heaters lighted only when the occasion requires. These are not separately metered; therefore, there cannot be comprehensive statistics on house heating in the natural gas industry.

According to the Bureau of Census, Department of Commerce, the total number of gas-fired central house heating installations in occupied dwellings connected to the lines of all United States gas companies in 1940 amounted to 1,108,889. In addition there were 2,724,155 occupied dwellings heated by gas-fired space heaters, floor furnaces, &c., giving a total of more than 3,833,044 occupied homes in the United States that are heated by gas, either natural or manufactured.

American Gas Association, Yours faithfully,
420, Lexington Avenue, New York. ALEXANDER FORWARD,
Feb. 5, 1943. Managing Director.

National Gas Council

A Meeting of the Central Executive Board of the National Gas Council was held on March 9, at Gas Industry House. Sir David Milne-Watson, Bart., LL.D., D.L., presided.

Mr. C. A. Masterman, who has succeeded the late Mr. Stephen Lacey as Convener of the Post-War Planning Committee of the British Gas Federation, was co-opted to the Board.

The resignation of Dr. E. W. Smith, Director-General of Gas Supply, was reported, and it was unanimously agreed that a letter be sent to him on behalf of the Board, thanking Dr. Smith for his services to the Industry, and expressing the hope that he would continue to help the Industry in other directions in the future.

A report on the general coal position was submitted. It was reported that two interviews had taken place with the Railway Companies, and that sufficient progress had been made to indicate that the essential point about demurrage was the amount of the standage charge. It was stated that a meeting of the full Demurrage Committee of the Conjoint Conference had been called for March 23 to receive a report of the negotiations with the Railway Companies, and to consider the position.

Regarding purchase tax, a note had been circulated to the members of the Board concerning (*a*) the uplift in the value of apparatus and appliances; and (*b*) the question as to whether such commodities as mitts, gloves, towels, and crockery should be subject to purchase tax at all, in so far as they are essential for the purpose of carrying on an undertaking. The officers were authorized to seek an interview on the subject with the Customs and Excise Department.

It was reported that a considerable amount of correspondence had been received by the Council with regard to the Hire-Purchase Charges Order (S.R. & O. No. 157), which prohibited the supply of domestic appliances and apparatus to consumers on hire-purchase terms.

The Officers were authorized to take up the matter with the Board of Trade with a view to obtaining some modification of the Order.

The next meeting of the Board will take place on April 13.

An Appeal

The Institution of Gas Engineers has received from Field-Marshal Sir John Dill a letter in the following terms:

"A fund has been registered under the War Charities Act, 1940, for educating at Cheltenham College the sons of engineers who lose their lives as a direct result of the war, whether they are in the services or are civilians.

"Other schools in the past have taken similar steps to provide for the sons of doctors, clergy, and other professional classes, but so far as I know little has been done for the sons of engineers, and it is fitting that a school well known for its interest in engineering (as is evidenced by the recent founding of studentships at Cheltenham College by Messrs. Thomas Firth and John Brown) should fill the gap.

"This is an engineer's war. All the fighting units depend for their efficiency on the engineer, both as part of their own strength and in the factories, supply services, transport, and mines.

"I can think of no better way of showing our gratitude to all engineers than by giving generously to this war charity. I welcome this opportunity of bringing the fund to your notice and shall be personally grateful for donations, large or small, which should be sent to me at the registered address of the Fund, "The College, Cheltenham," cheques being made out to "The Cheltenham College Fund for Sons of Engineers."

THIS INDUSTRIAL GAS

By H. R. HEMS,

Chairman of the Industrial Gas Centres Committee

GAS, its supply and distribution, is so much taken for granted, like most other modern utilities until they are restricted or cut off—experiences which war brings home to us—that it may be as well to review the build-up of the industrial load with its attendant use of furnaces, burners, and general industrial appliances.

Gas supply undertakings in the past have selected their loads either by limiting industrial consumption by the price policy adopted, or by going "all out" for those loads available in its area by offering suitably attractive gas rates, supported by technical advice from its own staff, or through the Industrial Gas Centres scheme. All this, of course, presupposes a readiness to provide mains extensions and services either without cost to the potential consumer or by mutual financial arrangement with him.

The big point gas undertakings have had to settle in the past is whether the industrial load is attractive. The war has reversed the position of undertakings in this matter, as so many who had no possibilities of industrial propositions have found factories springing up under dispersal schemes in their areas, and, willy nilly, have had large industrial consumptions added—sometimes to their embarrassment. The future of such loads will depend on post-war conditions, but according to official pronouncement, it is gathered that post-war planning will mean that many of these consumptions will remain in what have been previously more urban areas.

This leads one to think that all gas undertakings, large and small, will be brought into closer contact on the question of industrial load. In the post-war period, the large undertaking which appreciates the value of this, with its own technical organization will be keen to retain as much of its greatly increased wartime load as possible, and the small undertaking will be in a better position to assess the value of the industrial load. It is hoped that some endeavour will be made to set the conditions to retain these loads.

This is where the Industrial Gas Centres and the Committee co-ordinating all those Centres will be of great value. The Industrial Centres scheme must eventually cover the whole country if it is to fulfil the function originally intended by its formation. Under the present and potential possibilities of the scheme, the large undertaking will gain from its experience of wartime factory extensions and obtain valuable information from wartime specialized activities of small undertakings. The latter also would be in a position to draw upon the greater scope available to the larger industrial areas, at the same time contributing in no small way to the general pool of industrial gas knowledge. One relatively small undertaking in an industrial area, to the writer's knowledge, has undertaken a war job of work that will be the envy of many of its larger confrères when it is known after the war.

There never has been a time like the present when manufacturers have so demanded town gas for heat application. Figures of increased industrial consumptions when published after the war will easily confirm this, and reveal the tremendous part which town gas has played in the production of every kind of munition, from the heat treatment of the smallest " pin " for bomb or gun to the largest component part required for aeroplane, tank, large calibre gun, locomotive, rolling stock, and warship.

The groundwork of development commenced prior to the last War has brought forth fruit to a hundredfold. Early in the present war it was evident that town gas was, by common consent in industry, to play a most vital part in war production. Its values—*i.e.*, ease of application to practically all temperature range requirements, cleanliness, and close control—were appreciated by the user and potential user for all general heat treatment and many melting operations. Cost of fuel to a certain degree did not loom so largely as in peacetime. When it became obvious that the use of liquid fuels could not be extended beyond certain limits under wartime conditions, such was the modern trend in most metallurgical operations for the application of a refined fuel by pipe or tap, as distinct from solid fuel, that gas could have been adopted to a far greater extent for such operations if unlimited supplies had been available.

Many users of gas in large quantities are obtaining under present conditions a greater experience in the use of electricity and also producer gas, both for primary and emergency purposes, and this will weigh heavily when the use of a fuel for peacetime production is under consideration.

Surely an ideal set of conditions is before us. On the one hand, the gas supplier once having accepted the value of the industrial load and being in a position to meet the demand by service and satisfactory price factor; and on the other, the consumer, having by experience satisfied himself of the value of town gas in his particular industry, is desirous of continuing and extending its use. The intermediate stage is catered for by designs of improved and more efficient types of gas furnace compared with a few years ago. With all these conditions apparently favourable, it seems illogical not to expect that town gas will retain and extend its present value as a vital industrial fuel so long as the war may last, and it should be in a position to weather the storm of change-over to peace production. It should also be ready to enhance its position from then onwards. This depends on price policy, service to and co-operation with the consumer, research into new applications, further improvement in efficiency of furnaces, design, and manufacturing detail; and last, but not least, the appearance of such furnaces and appliances.

This is a prospect, based on previous accomplishments, which must justify the best efforts of the Gas Industry being put forward; one which any individual engaged in this particular branch of the Industry's work ought to view with enthusiasm; and which should justify personal reward of a high order both monetarily and from a sense of personal satisfaction.

There is a great feeling of achievement in seeing the industrial consumption of an individual firm rising and retaining the rise from an installation erected by oneself, and, better still, to see the industrial load of the undertaking one serves continually increasing.

The potentialities of the industrial load are immense. An excellent body of men to handle it is growing up within the Industry, and there is excellent work ahead for the technical profession who have this particular branch of the Industry's work at heart.

A Meeting of the Industrial Gas Centres' Committee will take place at Gas Industry House on March 25 at 9.30 a.m.

The Hire Purchase (Control) Order has now been revoked and replaced by the Hire Purchase and Credit Sale Agreements (Control) Order (S.R. and O. 1943, No. 321) in force from March 22. The new Order is more comprehensive than the one which has been revoked and covers both hire purchase and credit sale agreements, which are treated under it in exactly the same fashion. The effect of the new Order is to prohibit a sale, at a price over and above the retail cash price, of all price controlled goods, new or second hand, sold through hire purchase or credit sale agreements, except in the case of certain articles set out in the Schedule to the Order. These exceptions include domestic heating and cooking appliances, and certain other articles in respect of which an Order under Section 2 of the Goods and Services (Price Control) Order has not yet been made but will be made as soon as possible. These articles are, therefore, for the time being specifically exempted from the operation of the new Order.

Dividends

Radiation Ltd.—For the year 1942, on Ordinary Stock £8% less income-tax. Net profits for the year £145,913 (last year £130,432).

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the " Journal " should not be taken as an indication that they are necessarily available for export.

PROXIMATE ANALYSIS OF COAL*

By JOSEPH BROWN, M.Sc., and ALAN S. BEAN, M.A.

(*Concluded from p. 319*)

From the combustion angle changes in the M.A.F. volatile matter should be followed by exploration of the calorific value, if this has not already been done. When the calorific value is also calculated to the M.A.F. basis much interesting and valuable information may be obtained.

This is the last of the special calculations we shall spring on you here. The concept is that the heating value of the coal is entirely due to the volatile matter, plus fixed carbon, in the moisture and ash-free coal. This, it must be remembered, includes the sulphur from the ubiquitous pyrites, which is, of course, a substantial contributor to the total heat evolved. The calculation is exactly the same as the calculation of the M.A.F. volatile matter.

The calorific value of the M.A.F. coal is a very valuable figure. By cutting out the effects of the two great variables, moisture and ash, it brings the calorific value to a simple datum line for comparison. It enables an easy decision to be made whether the coal is true to type, or whether the calorific value as determined is likely or unlikely to be correct. The M.A.F. calorific value of most British coals will be found to lie between 6,800 and 8,800 calories, with odd examples lying beyond these extremes. For any given coal this value should lie within a range of about 300 calories, and deviations beyond this are generally worthy of investigation. Some coals are much more constant than this. A very useful feature of the M.A.F. calorific value is that, with this in hand, and given the proximate analysis or simply the anti-calorifics, it is possible to make a reasonable calculation of the calorific value on either the "air-dried" or "as sampled" basis. This is done by merely reversing the calculation used for obtaining the M.A.F. calorific value.

R. A. Mott,† following along the lines of the U.S. Bureau of Mines Classification of Coal, has devised a scheme using a rather more refined version of the M.A.F. calorific value as one of the means of subdivision of the groups. The refinement consists of calculating the result to what is known as the Parr basis, wherein the ash is calculated back to the mineral matter from which it originated and the volatile matter corrected for CO_2 coming from the ignition of limestone. The Parr basis‡ is therefore the moisture and mineral matter-free basis as opposed to the ash and moisture-free basis. This calculation is a much nearer approach to the true pure coal substance.

For those coals that run with fair constancy the proximate analysis can be used to make approximate calculations of the calorific value using the formula of Goutal. This formula evaluates first the calorific value of the volatile matter by the use of a special table, and second the calorific value of the fixed carbon, which is taken as 8,200 calories per gramme. The two are added together. We have used this as a rough check for many years.

A last item well worthy of mention is the Woodall-Duckham swelling test. This is a modification of the volatile matter test modified in such a way as to accentuate the swelling properties of the coal. It is given in full in B.S.I. No. 804, 1938, and we are finding it of increasing value, especially where it can substitute other, more tedious, forms of swelling test.

The proximate analysis is—or ought to be—an important and hard-working member of the staff of most collieries. It is particularly important when several seams are worked, and even more important when the seams differ considerably in character or are liable to change within themselves. The applications of the test are twofold:

(1) The control of production.

(2) The control of vended output.

By production we mean all stages of production from the coal face to the loading belts carrying the finished coal. Without overdoing things, the whole of the underground workings should be subject to test at convenient and not too wide intervals. For most collieries a complete review, at least once every year, is very well worth doing. This annual review should not be confined to the proximate analysis—already in daily use?—but should primarily be extended to other important tests related to the future use of the coal. In the interim any changes in the character of the seams are indicated by the routine proximate analyses.

In general the producer is controlled by the coal seams he works, but there are times when temporary or even permanent alterations in the character of the coals cannot be avoided. After all, he doesn't *make* the coal, he simply mines it, and no matter how far such alterations are from his actual desires there is nothing he can do about it, except to know about it in good time, and see to it that the affected portion of the output is well spread through the whole or put to special purposes.

The general character of the vended output is fixed by the character of the seams and districts, and the planning of their working, but when the coal has been brought to bank there is still much to do. As far as possible the stony impurities and inferior coal must be removed, and the control of this work calls for constant testing. It is not, of course, necessary to carry out a full proximate analysis. The moisture and ash—or, for dry coals, the ash alone—are sufficient. There is also the checking of size and the quality of special gradings. The remaining and most important part of the work is the testing of the vended output so as to check the quality of the consignments. Taken over a long term the results of these tests build up into statistics showing both "averages" and "extremes" that give the sales side a really reliable foundation on which to work. And information beats guesswork!

The sales organizations of those collieries which regularly employ their own analysts or independent analysts have, of course, built up elaborate statistics, and are mostly in the habit of issuing brochures giving analyses of their coals, grade by grade. Many of these brochures are issued at frequent intervals, and it is a matter of pride to many that the average analyses are shown to be very constant. Some of the big distributors have published collections of analyses of British coals that are not simply optimistic figures designed to show the world what good coals we produce, but are sober recitals of reliable average analyses, and are respected abroad as such. Thousands of tons of paper representing countless copies of carefully compiled books of tabulated information have been spread to all parts of the globe where coal is used.

Gas coals are peculiarly liable to complaints of low volatile matter because, as a rule, for any one gas coal the gas yield will rise with the volatile matter. Whole collieries have been sampled and tested from one end to the other because of a small falling-off in average volatile matter, and no rest given to anyone until the defect had been remedied. The new temperature for the volatile test will reduce all the Durham gas coals by at least 0.5%, and thoroughly upset all statistics for no useful purpose that we can see. If allowed to remain, there will be a good deal of misunderstanding, between producers, receivers, analysts. The prospect is anything but cheerful.

The consumer and his technicians really set the pace for the whole of the coal trade. He it is who eventually finds the coals best suited to his purposes, and armed with this knowledge, uses the proximate analysis to ensure continuity of supplies. Even so, we often find that where the consumer's laboratory has many classes of work to handle, the sampling and analysis of coal is not always treated with the seriousness it deserves—particularly the sampling. Any old method seems to suffice at many works, which is hardly fair to the producer. In their laboratories it is not always realized that the component tests of the proximate analysis are purely arbitrary, and cannot be undertaken without systematic rehearsal of the techniques necessary, particularly that of the volatile matter test, which cannot reasonably be undertaken at all unless the proper equipment, including a pyrometer of good make, is available. Much worry, much correspondence, and much unnecessary travelling would be saved if this could be universally realized.

Abuses of the Proximate Analysis

The use of the proximate analysis to make complete predictions about the industrial performance of coal has long been the dream of many coal analysts. We have come into contact with several of these fanatics who, with all the solemnity of the Mad Hatter, declared that by their system the proximate analysis could be used to predict the gas-making properties or the shatter index of the coke, or even to say how much ammonia liquor might be expected. A Continental analyst told one of us in all seriousness that he could go to a ship, and after taking up a single tablespoonful of coal as a sample would then carry out a version of the proximate analysis. Then by a system of calculation he would proceed to state the coke, gas, tar, and liquor to be produced from it in the coke ovens to which he was attached. We might add that the same learned gentleman conclusively proved that the same coking coal sold abroad under two different names was really two different coals. Another announced that could he but be told the proximate analysis and the volatile sulphur his system would go so far as to establish in advance not only the yields of coke, gas, and liquor, but even to state the analysis of the gas!

We mention these extremes only as a solemn warning against overworking a valuable ally, especially when there are supplementary tests capable of making accurate decisions at those times when the proximate analysis cannot tell us all we want to know. We have no desire to stifle discussion of the real uses of the proximate analysis, but hope rather to learn from those who have daily contacts with its application to industrial problems in those spheres where we have none. No one appreciates more than we do how much information can be gained from simple analyses when taken in conjunction with day-to-day operation and observation of plant. We cannot hear too much of this, because one man's experience may confirm that of another, and so lead to interpretations that are really worth while.

* From a Paper to the Institute of Fuel, Feb. 18.

† Midland Coke Research Committee's Reports.

‡ *Cf.* J. G. Bennett, *Journ. Inst. Fuel*, 1941.

COAL AND PLASTICS*

By REGINALD L. WAKEMAN, Mellon Institute, Pittsburgh ; and B. H. WEIL, Gulf Research and Development Company.

IT is timely to consider the dominant role which coal plays as raw material in the production of essential intermediates for nearly all synthetic resins and plastics. In such fields as polyamides it reigns supreme; in others, like the phenolics, its rule is almost undisputed, but in still other realms, such as the methacrylates and vinyl polymers, its sway has been effectively challenged and its kingdom so successfully invaded by petroleum and petroleum gases that the demarcation of territory belonging to each raw material source is often wellnigh impossible.

Light oil, coal tar, coke, and water gas all contribute their share to the plastics industry.

The essential components of light oil and coal tar which pass into large-volume plastics are benzene, naphthalene, the tar acids, and coumarone-indene fractions. Cyclopentadiene and dicyclopentadiene have attracted some attention and will probably receive more in the future, although as yet their polymerization and condensation products can scarcely be considered big-volume plastics. Toluene also finds limited use in the production of sulphonamide-formaldehyde resins for lacquer and adhesive formulation.

The remarkable increase in demand for coal tar chemicals by the plastics industry during the past quarter of a century is especially spectacular in the cases of phenol and naphthalene.

A Fundamental Role

Historically, tar acids have played a fundamental role in the development of the plastics industry, for bakelite, the first purely synthetic resin, was originally manufactured exclusively from natural phenol. During the war of 1914–18, when phenol became scarce, the cresols and xylenols were investigated and found to yield resins of excellent merit, so that their use was continued after the Armistice. Appropriately treated to maintain a low *o*-cresol content, they still play an important part in the production of phenolic resins to-day, especially those used for laminating.

Of the total reported 1941 production of 157 million pounds of phenolic resins, some 99 million pounds were derived from phenol alone and the remainder from cresols, cresylic acid, and xylenols, alone or mixed with phenol. This would have required some 96 million pounds of phenol and 36 million pounds of cresols and xylenols. The cresols and xylenols were almost entirely natural in origin, but petroleum cresylic acids give promise of future usage.

Present phenol production is estimated to be about 25% natural, the remainder synthetic. In the latter case benzene is universally the basic raw material employed. On the basis of present-day operational methods, about 68 million tons of coal were required to supply the phenol for last year's phenolics, while about 57 million tons supplied the tar acids for other types of phenolics derived from phenol homologues. These two figures are, of course, not additive, since coal yields benzene, phenol, and cresylic acids simultaneously in most recovery systems.

Benzene and, particularly, naphthalene, rank high as essential raw materials for the production of alkyds which, non-existent in 1925, now equal the phenolics in importance and rival them in volume. In 1941 the production of alkyd resins from phthalic anhydride reached a reported total of 128 million pounds and from maleic anhydride, 9.5 million pounds. These acid anhydrides are produced by catalytic oxidation of naphthalene and benzene, respectively.

Rubber Compounding

The highly unsaturated naphtha cut from light oil contains much indene and coumarone, and these products are polymerized, usually with sulphuric acid, to yield resins ranging in colour from light amber to dark black, and in melting-point from molasses-like syrups at room temperature to friable solids melting at 150°C. or above. They have found extensive use in rubber compounding, terrazzo floor tile, printing inks, paints, lacquers, and chewing gum. Hydrogenated products have recently appeared on the market. Several more or less similar resins of comparable thermoplastic characteristics are also produced by modification with phenols. Polymerization of cyclopentadiene and dicyclopentadiene, condensation of naphthalene and formaldehyde, and polymerization of partially hydrogenated naphthalenes have also, in times past, yielded small amounts of analogous resins. These related products are all small-production items at present. The volume of coumarone resins manufactured last year is estimated at 30 million pounds, which, by a rough estimate, would have required recovery of the indene-coumarone fraction from by-product coking of nearly 100 million tons of coal. About 90 million tons of coal were coked in 1941, of which some 90%, or approximately 80 million tons, were handled in by-product ovens. Hence it is apparent that most of the indene-coumarone fraction recoverable from by-product operations was utilized last year by the plastics industry.

* From *Industrial and Engineering Chemistry*.

Plastics Derived from Water Gas

Water gas, derived chiefly from coke, is no less essential as a raw material for the plastics industry than coal tar and light oil. In the case of the phenolic resins, for example, coal serves not only as a source of tar acids and synthetic phenol, but also, through water gas, as the most important source of formaldehyde. This chemical, now also made in limited amounts by direct oxidation of natural gas, is still produced mainly by oxidation of synthetic methanol. While some methanol is produced from water gas originating with methane, that acutally used by formaldehyde producers presumably comes from coal. In 1941 the total formaldehyde production for all purposes was about 277 million pounds (basis 40%). Of this, about 150 million pounds found its way into phenolic plastics and approximately 60 million pounds into other types of plastics. Of the latter, the ureas are most important. These plastics, not produced in this country before 1929, were made to the extent of about 35 million pounds last year, some 50% going into moulding powders and 50% into lacquers and adhesives. They are used extensively in moulded housings, buttons and buckles, light shades and reflectors, electrical fixtures (especially where non-tracking is important), and in a miscellany of novelty applications. In combination with alkyds they have become indispensable in white lacquers, especially refrigerator enamels. Urea adhesives, both cold and hot setting, have gained ground in a spectacular manner since their introduction in this country about three years ago; they now are used in considerable volume in plywood manufacture. The urea resins are produced by the reaction of urea with formaldehyde. Coal serves not only as the principal source of formaldehyde, but also of carbon for urea which is the product of the interaction of carbon dioxide and ammonia. Ammonia is, of course, also a product of coal distillation.

Methanol is an intermediate in the production of other chemicals besides formaldehyde which are absorbed in the manufacture of plastics. It is converted to methyl chloride which, in turn, enters into the production of methylcellulose, used largely as a paper size and textile treating agent. Some 72 tons of coal were required for the production of water gas, which by this tortuous path finally appeared on the market as methylcellulose last year. This corresponds to an estimated 500,000-pound production. Furthermore, by high-pressure reaction with carbon dioxide, methanol yields acetic acid, used in the manufacture of cellulose acetate.

Indirectly through a formate, carbon monoxide from water gas is reacted with ammonia to yield formamide, which is subsequently dehydrated to hydrogen cyanide, used in increasing amounts to produce acetone cyanohydrin, which is then converted to methyl methacrylate and polymerized.

Plastics Derived from Coke

In addition to its use in the production of water gas, coke serves directly as a source material for a large number of synthetic organic chemicals, of which an ever-increasing number find their way into the plastics industry either as plasticizers or in the manufacture of the resins themselves. Coke is routed into plastics manufacture by either of two main highways through calcium carbide—namely, acetylene and calcium cyanamide. The latter is a source of cyanide, used in the manufacture of acrylonitrile, one of the components of oil-resistant Buna N and Hycar. This type of oil-resistant rubber was first produced in this country in commercial quantities late in 1940. Cyanide can also serve as intermediate in the manufacture of methacrylonitrile, which, in turn, is converted to methyl methacrylate and polymerized to the highly transparent plastics—lucite, plexiglas, and crystalite. It is probable, however, that a considerable fraction of these plastics is produced from hydrogen cyanide obtained by catalytic dehydration of formamide, derived from carbon monoxide and ammonia. The methacrylates, although produced in smaller volume than the more time-honoured plastics, have become well known because of their spectacular clarity, which permits a large number of unique optical and decorative applications. To-day they are indispensable in airplane wind screens. It is estimated that about 5 million pounds of methacrylates were produced in this country last year. For their manufacture, intermediates from 25,000 tons of coal were required in addition to those derived from petroleum.

Calcium cyanide is the only source of dicyandiamide, and this chemical, in turn, is now converted to melamine, the intermediate which, upon reaction with formaldehyde, yields the new melamine resins. These products are now going solely into war applications, except for small amounts being used for experimental work. They will undoubtedly increase in favour after the war.

Chemicals derived from calcium carbide through acetylene are numerous. With a few notable exceptions—nitrocellulose, rubber derivatives, and polyvinylidene chloride—they enter into the production of all the thermoplastics to a greater or less extent. This picture, however, is far from clear because of the fact that petroleum products, especially natural and cracked gases, likewise provide huge

amounts of many of these chemicals. In some instances products which can be derived from one source can be produced at almost the same figure from the other. Among the thermoplastics, cellulose acetate is by far the most important. Acetic acid and acetic anhydride are both required for its manufacture.

Acetic anhydride is produced from acetylene by pyrolysis of ethylidene diacetate and by controlled oxidation of acetaldehyde, but still larger volumes come from ketene, obtained by pyrolysis of acetone. The latter, once a large-volume acetylene derivative, is now largely obtained from the propylene content of cracked gases, although it is probable that some still comes from coal as well as from the fermentation of cornstarch, an operation which has persisted, for better or worse, since its introduction during the first World War. Acetic acid likewise is produced from acetylene by hydration to acetaldehyde, followed by oxidation. But some acetic acid is also produced by oxidation of ethanol, and small amounts are still obtained as a by-product of wood distillation. Its manufacture from methanol by reaction with carbon dioxide is a recent innovation which has already been mentioned. It is estimated that somewhere around 5,000 tons of coal were coked in 1941 for conversion to acetylene consumed in the production of acetic acid and its anhydride, destined for the manufacture of cellulose acetate plastics, exclusive of acetate yarn.

Acetylene from coke is also the source of neoprene synthetic rubber, for the production of about 13 million pounds of which in 1941 some 11,000 tons of coal were required. Small amounts of S-D-O obtained as a by-product from neoprene manufacture also represent still another resinous product derived from coal.

Coal is thus an important source material for the plastics industry. Plastics made from coal intermediates have shown each year a healthy rate of increased production. It seems proper to envision much greater expansion after the war. But the coal industry must take cognizance here, as in other chemical industries which use its products, of the recent but already important factor of competition with petroleum and natural gas hydrocarbon derivatives.

The coal industry's domination of the phenolic resin field may soon be challenged not only by phenol from petroleum benzene, but likewise by increasing quantities of petroleum cresylic acids.

Nor should the coal industry expect competition from only one quarter. Agricultural products may be expected to play an increasingly important role in the plastics industry of to-morrow. Brazil is keen about a large programme for the production of plastics from coffee. Soybean resins have already entered the field. Patents appear in great numbers for the production of plastics from cottonseed hulls, corn proteins, and bagasse. In the synthetic rubber picture, butadiene from alcohol and other agricultural products is now a certainty. Waste sulphite liquors and exploded wood chips are constantly contributing larger volumes of lignin plastics.

The coal industry need not necessarily suffer from this competition, even though prices will undoubtedly resume their downward trend after the war and the markets for some intermediates may be lost. The prospects for a tremendous increase in the volume of plastics production will render the future for coal derivatives extremely bright if every effort is made to maintain research, reduce basic costs of manufacture, increase yields, and produce a varied and flexible number of intermediates.

Research must continue to be the watchword of the day!

EXPERIMENTS WITH LOW TIN-CONTENT SOLDERS*

By the AMERICAN METER COMPANY

THE samples first tried were of the following composition: No. 30-A—30% tin, 1.25% silver, 0.5% bismuth, 0.5% antimony; No. 372—30% tin, 1.8% antimony, 0.1% arsenic; balance lead. Both solders worked satisfactorily for the valve-table assembly as far as cracking was concerned. Although the rate at which the solders could be applied was much slower for both samples, 30-A flowed the better of the two. The valve-table assemblies were examined shortly after soldering and every week thereafter for six weeks, to investigate the cracking of the solder. No cracks occurred.

Five cases were assembled with each 30-A and 372 solders. The additional time to use either solder was estimated at 20–25 per cent. longer. 30-A solder for this operation appeared to be easier to apply and flowed more similar to 38/62 solder. The cases were examined six weeks later and no cracks were evident.

In view of the success that was had with 30-A for the valve-table and case assemblies, five meter cases had their diaphragms soldered in with 30-A. However, shortly after, cracks occurred at the partitions and diaphragm ring seam. Difficulty was experienced because when one diaphragm had been soldered in place and the other diaphragm was being soldered, the first diaphragm ring would crack away from the partition. The five meters were examined several weeks later and as far as could be seen no further cracking occurred.

Five meters had the fronts and backs soldered on with 30-A and with 372. For this operation the two solders worked very much the same. The additional time over 38/62 solder was 30% longer. These 10 meters were then fit up with 30-A and 372 and tested for tightness. The results were as follows:

30-A. Three meters tight.
One meter back gallery seam cracked badly and as a result leaked.
One meter front side had small crack and leaked slightly.

372. Two meters tight.
Two meters had cracks at the bottom back seam resulting in leaks.
One meter had small back plate leak.

After six weeks the 10 meters were examined for cracking at the seams.

The results were as follows:

30-A. Three meters had slight cracks at bottom seam.
One meter had slight bottom crack and side seam crack.
One meter had back gallery seam cracked and slight bottom and side seam crack.

372. Two meters had slight cracks at the bottom seam and at side seam.
One meter had slight cracks at gallery seam and at bottom seam.
One meter had slight cracks at both bottom seams.
One meter had slight cracks at both bottom seams and at one side seam.

The results with 30-A were better than No. 372, however, because of the cracking and leaks that occurred. Neither solder was considered safe to use. The method used in soldering with either 30-A or 372 was the usual method except that a hotter iron was used.

The next 30% solder tried was designated as No. 373. The antimony content had been increased by 0.3%. Thus the formula for No. 373 was: 30% tin, 2.1% antimony, 0.1% arsenic; balance lead.

Twelve meters were assembled using No. 373 for the soldering on of the fronts, backs, the triangles and back plates. The results were better than with No. 372.

No. 373. Ten meters were tight.
One meter leaked at bottom seam.
One meter had small back plate leak that could have been avoided by more careful workmanship.

The meters were examined for cracks one week after the soldering had been completed.

Seven meters showed no cracks.
Two meters showed slight cracks along the bottom seam.
Two meters showed slight cracks along the bottom seam, and along side seam.
One meter showed serious cracks along a seam at the back and side joint.

All 12 meters showed very slight cracks at the gallery seams. The cracks that appeared were more evident where the soldering was light. To overcome this cracking it would be necessary to plumb over the seams and to concentrate as much as possible the heat of the iron to a limited area. This is true because the cracking that occurs is caused by movement of the parts when the solder is still in its plastic condition. With 50/50 solder the solidification range is much less: 50°F. for 50/50 solder and 137°F. for 30/70 solder.

The next 30% sample tried was designated as 30-H. This was an improvement on 30-A solder, the formula being 30% tin, 1.25% silver, 2.0% antimony; balance lead.

Twenty-five meters were assembled with the fronts, backs, triangles, and back plates soldered with 30-H. The increase in operation time in using 30-H as compared with 38/62 was about 5%. However, this time should be reduced after more experience is gained in the use of 30-H. Here again more heat must be applied. The flowing properties are similar to those of 38/62. Some workmen thought 30-H flowed even better than 38/62 solder. The results were:

30-H. Twenty meters were tight.
Five meters had small back plate leaks that could have been avoided with the use of more solder.

The meters were examined one week after the soldering had been completed.

Twenty-three meters showed no cracks.
One meter had slight crack at side seam.
One meter had small crack at bottom seam.

The cracks occurred in the two meters where the solder was definitely light.

In view of the success experienced with 30-H on the front and back operation, 30-H was tried on valve-table assembles. Time for 25 tables was about 5–10% longer than with 38/62. No cracks occurred, however, and the solder flowed satisfactorily.

30-H was then used for the diaphragm operation on 10 meters. This operation has been the most difficult to use low tin solders on

* From *Gas Age*, Nov. 5, 1942.

because of soldering on both sides of the partition. Of the 10 meters, four showed bad cracks at the diaphragm ring and partition seam. We have been investigating various methods of assembling the diaphragm to the partition; however, as yet, no method has been found that will eliminate completely the cracking away of the ring from partition. There is too much tendency for the partition to buckle from the heat applied by the soldering irons. The operator must resolder the cracked portion. After this is done no new cracking under normal temperature changes seems to appear.

Twenty-five meters were topped in the usual way; that is, not tipping the meter, using 30-H solder. The results were not satisfactory because 16 meters showed cracks at the back seam; three of the 16 leaked; nine meters were O.K. Twenty-five more meters were topped using the method of tipping the meter and banking up the solder. All 25 meters were tight and none showed cracks.

Both 30-H and 373 solder samples worked much better than any previous 30% solder. Because of this further investigations were conducted.

Fifty meters were assembled using 30-H for 25 meters and 373 for 25 meters.

The results were:

1. All 50 meters were tight under 2 lb. pressure.
2. One of the 30-H meters showed slight crack at the bottom seam where the soldering was light.
3. One of the 373 meters displayed a definite side seam crack where the coverage of the solder was not as heavy as at other seams. Five of the 373 meters showed slight cooling cracks at bottom seam.

Three of the 373 meters showed slight cooling cracks at gallery.

The 373 solder shows a more definite tendency to crack than 30-H.

Four meters of 30-H, four meters of 373 and four meters soldered with 38/62 solder was submitted to an extreme temperature variation from — 20°F. to + 150°F. After many cycles of temperature variation, no change was noted in the 12 meters. All tested tight at the conclusion of the test. It is planned that these meters will be further submitted to extreme temperature variation. However, in view of the fact that no enlargements of any small cooling cracks took place and also the fact that the meters remained tight after the many temperature variations, it appears that the two 30% solder samples have a very small tendency to crack under temperature changes.

Six meters were submitted to a strenuous vibration test. Two meters of 30-H, two meters of 373, and two meters soldered with 38/62 were placed on the floor of a delivery truck. The truck travelled a total of 1,000 miles in city and country driving. At the conclusion of this test run the meters were examined for cracking in the solder. All meters appeared to have undergone no change except for one of the 373 meters. This meter showed a leak at bottom seam. The leak resulted from a blow hole in the solder along a slight cooling crack. The vibration might have enlarged this crack and blow hole sufficiently to cause a leak where previously the meter had been tight. However, it was difficult to notice by visual observation any change in the cracked seam. Soldering flux might have previously helped to make this joint tight.

Conservation of tin by reducing the tin content is somewhat misleading unless the relative densities of tin and lead are kept in mind. The densities of tin and lead are 0.244 lb. of tin per cu.in. and 0.411 lb. of lead per cu.in. Expressed in another way there are 4.1 cu.in. in a pound of tin and 2.433 cu.in. in a pound of lead. Solders are usually designated by the percentage by weight of tin and the percentage by weight of lead. Hence, for 1 lb. of 50/50 solder there are 2.05 cu.in. of tin and 1.22 cu.in. of lead. Total volume of solder is 3.27 cu.in.

One pound of 30/70 solder is composed of 1.23 cu.in. of tin and 1.70 cu.in. of lead. Total volume of solder for one pound is then 2.93 cu.in. for 30/70 solder, 3.066 cu.in. for 38/62 and 3.27 cu.in. for 50/50 solder.

Hence for the same volume about 11½% more 30/70 solder, by weight, would be needed. The tin reduction for 30/70 solder as against 50/50 solder is 40%. However, if 11½% more solder is necessary, then the net reduction of tin is 33.1% by weight. For 38% tin, 62% lead, 6.6% more solder is necessary for the equivalent volume of 50/50 solder. This means then that the net reduction of tin is 17.7% for 38/62 solder as against 50/50 solder.

However, in the assembly of new meters, it has been necessary to use from 10–15% more 38/62 solder than 50/50 solder. This means then that the tin reduction is less than the theoretical 17.7% stated above. In the use of 30-H and 373 solders less 30-H solder is used than 373 because it is not necessary to bead the solder so heavy in order to avoid cracking. For most operations the same amount of 30-H is required as is 38/62. This represents a considerable saving in the percentage of tin consumed. Percentages of solder used vary between new and repair meters. In the case of the repair meter considerable 50/50 solder is left on the meter or else 50/50 is used for tinning, and as a result the percentage of tin of the solder at the joint will be higher than the 30% solder being used.

The number of leaks occurring in the assembly of new meters has risen considerably during the period that 38/62 solder has been used. The increase has been from 3 to 10%, depending upon whether the testing was for diaphragm and channel leaks or for outside leaks.

30-H solder has been used for the fit up operation on 1500 meters. The number of leaks for these meters is the same as was experienced with the use of 38/62 solder. No new soldering technique is required for the use of 30-H. A slightly hotter iron, however, must be used.

The soldering-in of the diaphragm requires more time to join the diaphragm ring satisfactorily to the partition. However, in conclusion it can be stated that in view of the above experiences 30-H solder of the following composition, 30% tin, 1.25% silver, 2.0% antimony and 66.75% lead can be used for fabricating of new meters and the repair of meters that have been in service.

GAS LIGHT AND COKE COMPANY

The Ordinary General Meeting of the Gas Light and Coke Company was held on Thursday last at Gas Industry House. Sir David Milne-Watson, Bt., LL.D., D.L., the Governor, presided.

The Secretary (Mr. Brian Wood) read the notice convening the meeting.

The following is the statement of the Governor, circulated to the proprietors:

The Directors are pleased to be able to recommend the resumption of the payment of dividends for the year 1942 on the Preference stocks in full and, at reduced rates, on the Ordinary and Maximum stocks.

As you already know, the Directors are prohibited by Government order from discussing the accounts, and in these circumstances, which are not of our making, we can only assure stockholders once again that everything is being done that can be done to serve their interests faithfully.

In December, 1942, the Directors appointed Mr. A. E. Sylvester as a Managing Director of the Company. Mr. Sylvester brings to his new tasks the wide experience, the great qualities of organization, and the grasp of essentials which made his professional career so successful, and have benefited the Company so signally during the nine years in which he has served it, first as Comptroller and, latterly, as General Manager.

Mr. Michael Milne-Watson, recently appointed Commercial Manager, has been on the staff of the Company for a number of years, and throughout the war has acted as Manager of the London Regional Gas Centre. This organization was set up just before the outbreak of the war and proved its worth during the intensive bombing of London; it still stands ready and fully equipped to spring into action at any moment.

We report with regret the death, in retirement, of two former servants of the Company: Mr. R. W. Hunter, for five years our Chief Engineer, and Mr. H. Rayner, a previous Secretary. Mr. Hunter, who retired owing to ill-health, died suddenly in October last year. His death is deeply regretted by everyone who knew him, or had ever worked with him. Mr. Rayner retired in 1916 after 42 years with the Company. He continued to take a keen interest in the company throughout his retirement.

The death of Mr. Stephen Lacey in January this year at the early age of 57 is a blow not only to the Company in whose service he had spent most of his life, but also, in his capacity as Convener of the Post-War Planning Committee, to the whole Gas Industry. Stephen Lacey's family had been connected with the Company for over 100 years, and in his distinguished career, as Distributing Engineer and then as Controller of Gas Sales, Mr. Lacey notably upheld the family tradition.

The setting up of a separate Ministry of Fuel and Power with Major Lloyd George as its first Minister marks an historic milestone in the road and leads to the full development of the country's fuel resources.

As long ago as October, 1941, I ventured in my Presidential Address to the members of the Fuel Luncheon Club to make the following remarks: "After the war the nation will be much poorer, and it may have to rely to a greater extent upon its own national resources, so that the need will be greater than ever for conserving our coal supplies, and putting them to the best possible use . . . how can we best ensure that the future of coal is adequately safeguarded? . . . I have always felt that each fuel has its proper sphere, that each is better adapted than the others for particular purposes. But in the past, in the absence of any authority to prevent it, each has sought to impinge upon what has been regarded by others as their proper sphere. The result has been, in many cases, the use of fuel uneconomically, both from the point of view of the user and of the State. . . . Having regard to the important part which fuel must play in post-war reconstruction, it is most advisable that a single authority should be in control . . . every kind of fuel need, both industrial and domestic, will have to be met in the most efficient and economical way, and it would be to the advantage of all concerned if information as to the best practice were to be obtained from a single source."

Few, I am sure, would wish to return to the piecemeal policy of the past. Now that fuel problems can be thrashed out with a single authority able to view them as a whole, we look for the development

of a national fuel policy overriding the interests of particular sections. We have no fear that the Gas Industry with its economical carbonization of the country's coal and its indispensable by-products will suffer from such a policy; on the contrary, it should be sure of a square deal. We ask no more than that. It will be our duty to mobilize every ounce of the Industry's great energies and resources so that it may make its full contribution, both now and in the new world we are helping to create.

Thousands of the Company's men, and not a few of its women, are now on active service. A number have earned distinctions; we are proud of them.

On the home front conditions are getting harder and longer hours are being worked, but the majority accept the difficulties cheerfully as their share towards winning the war. The thanks of the Directors go out to all employees for their loyal service.

The dividends as recommended were approved; Mr. A. E. Sylvester was elected a Director; the retiring Directors, Mr. Henry Woodall and Sir Reginald James Neville Neville, Bt., and the Auditors, Mr. Percy Howard Ashworth and Mr. Herbert Edward Ibbs, were re-elected, and the proceedings terminated with a vote of thanks to the Governor, Directors, and to all the employees.

SOUTH METROPOLITAN GAS COMPANY

The Ordinary General Meeting of the South Metropolitan Gas Company was held in London on March 10. Mr. Frank H. Jones, M.Inst.C.E., the President, was in the Chair.

The following are extracts from the President's statement circulated with the Directors' report:

My task to-day is a pleasanter one than it has been at our last two meetings, for we are able to return to the ranks of the dividend payers, and your Directors are glad to recommend that the full dividend for 1942 be paid on the Preference stocks, which are non-cumulative, and that a dividend of 1% be declared on the Ordinary stock. Naturally, we wish that this latter dividend could be higher, for we realize how serious a matter the absence of dividends has been for many shareholders; but I have little doubt that you will attach more importance to the resumption of dividend than to the amount. We hope that our progress will continue; but none can foretell what conditions the war may yet bring, and in these circumstances I can prophesy and promise one thing only, and that is that your Directors and your employees will do all they can in the best interests of your Company.

The improvement in the year's results is, of course, due mainly to the quieter conditions which have prevailed; and this, I think, we can gratefully attribute to the growing strength of the forces of the Empire and our Allies.

There have been two increases in the price of gas during 1942—one of 1½d. a therm under a Board of Trade licence which took effect last March, and the other of ½d. authorized in the autumn in view of the increased costs of coal and labour. Gas prices cannot be increased without Government authority, except in a few cases of industrial supplies; and in this matter the mills of the Ministry grind exceeding small. Many items enter into our costs, of which coal and wages, although the main, are only two; and their tendency to rise is constant and recurrent.

We, on the other hand, suffer from a time lag in applying any increase in the price of gas. For one thing, there is the time involved in obtaining the Ministry's sanction; and, secondly, it is never possible for us to make an increase effective overnight, as the Government, for instance, can make an increase in the tobacco duty effective. It takes weeks for all meters to be read; sometimes the prepayment mechanism of slot meters has to be adjusted, and this takes money as well as time.

Such items, though small individually, may amount to a not inconsiderable total in the year. These facts are, I find, apt to be forgotten. They explain why, apart from the consideration that every business wishes to sell its products as cheaply as possible, we are always reluctant to increase the price of gas and never do so unless it is absolutely necessary.

Last year I drew attention to what the Chancellor of the Exchequer, in introducing his 1941 Budget, said about stabilizing the prices of essential goods and services, in which he included gas and electricity as well as coal. In deference to the Government's request, which later became a statutory prohibition for all undertakings, we had refrained from increasing our prices during 1940 and 1941, under the impression that stabilization was not to be a one-sided operation, and that the treatment which had been applied to other essential commodities would also be accorded to the essential service of gas supply. We have heard nothing further from the Government on this subject.

The most vigilant attention has had to be given to the maintenance of our coal supplies, and in this respect we have been well served by the staff in Newcastle and by our colliery friends in the North, with many of whom we have had the most friendly relations for a large number of years. This tribute must include the gallant service which we continue to receive from the crews of our own fleet and from the chartered steamers.

In normal times it would be a paradox for the chairman of a gas undertaking to tell his shareholders, with gratification, that consumers were economizing in the use of gas, but I am pleased to say that there is good evidence that such is the case. The Minister of Fuel and Power said a few days ago that the response to his appeals for the voluntary reduction of fuel consumption had been such that he had every hope that the need for introducing a coupon rationing scheme will not arise. But, he added, the need for unremitted economy remained urgent; and I need hardly say that your company will continue to do all in its power to help the Minister's appeal.

The position of public utility undertakings with regard to War Damage insurance is different from that of other businesses, and the Government announced before the War Damage Act of 1941 was passed that it was proposed to introduce a special Bill for them. The promised Bill has not yet been introduced, but the general lines of the Government's scheme have been explained in a White Paper published last November. Briefly, the public utilities are to be divided into nine groups—one for gas, one for electricity, one for railways, and so on. The damage suffered by all undertakings in each group will be aggregated, and will be met as to one-half by contributions from members of the group and as to the other half by the Government. Each group is to be left to devise its own scheme for levying its contribution, or, if it cannot agree on a scheme, one will be drawn up for it by the Government. Although the Bill has not yet been introduced, nor the rate of contribution fixed, some provision has been made in the 1942 accounts towards the payment of our prospective premium.

My review of 1942 would not be complete if I did not draw your attention to an event which may prove of outstanding importance to the Gas Industry, and, indeed, to the whole industrial and economic life of a country whose greatest material asset is coal—I mean the establishment of a Ministry of Fuel and Power. I say "may prove," because so far the Ministry has naturally been engaged almost entirely on problems directly connected with the war effort, and what is intended for it after the war must await the event; but if, as I believe, the Ministry has come to stay, and if it directs itself in the post-war world to what its title implies—the development and use of the nation's fuel resources to the best economic advantage—a great step forward will have been taken.

In such a régime each form of fuel and energy should have its appropriate place, the one complementary to the others. Such is surely the logical economic development, and I am betraying no secrets when I say that the Gas Industry, while devoting itself wholeheartedly to helping in the prosecution of the war, is preparing for the fuller contribution which it feels itself particularly fitted to make to national progress. The Industry has set up its post-war planning committee, of which our general manager, Mr. E. V. Evans, is Vice-Chairman, and its recommendations will be awaited with much interest.

One other event of the year I must mention, and that is the publication of the Beveridge scheme for social security, for it may have an important bearing on our own insurance and pension schemes. We are the only undertaking in the country to run our own all-in scheme of health, unemployment, and superannuation benefits, in substitution for State insurance, and we were, of course, much interested to read what Sir William Beveridge said on that subject. It is too early to say more: fortunately we have among our senior officers one who knows as much about social and industrial insurance as anyone in the country, and we shall look to Mr. Lesser, our Service Secretary, for advice in this matter.

The dividends as recommended were approved.

The Halifax Town Council has unanimously decided to increase the salary of the Gas Engineer and Manager, Mr. James MacLusky, by £100 per annum, thus raising it to the maximum figure which has been paid to any Gas Engineer in Halifax.

When the Mayor of Cambridge proposed a Fuel Economy campaign during the first week in March, the public utility companies were invited to co-operate. A committee was formed to make the necessary arrangements, on which the Gas Company was represented by the General Manager and Secretary, Mr. J. Hunter Rioch, and plans were evolved to hold separate exhibitions, to ensure that the appeal for economy in all kinds of fuel should be as wide as possible. The Cambridge University and Town Gas Light Company staged its exhibition at the head showrooms, and planned to explain, in simple and self-explanatory fashion, why economy is necessary, and how it can be achieved by all classes of consumers. An eloquent reminder that gas is indispensable in the factories was provided by a window display consisting of many war weapons and ammunition, together with a series of action photographs. Charts and diagrams based on the fuel target, but adapted for use at Cambridge, gave a clear and detailed explanation of the fuel allowance, supplemented by a series of economy hints. The principal by-products from the Gas Industry were also featured with good effect, while cookery demonstrations gave the latest information from the Kitchen Front, and supplied the opportunity to emphasize how fuel could be saved in an effective way.

Gas Products Prices

The London Market Mar. 15.

The chief item of interest in connexion with the Coal Tar Products market is the issue of a new Government Order, the Coal Tar Products Prices Order, 1942 (S. R. & O., 1942, No. 2509), which came into force on Jan. 1.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

The Provinces Mar. 15.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Naphtha and Xylol controlled by the Coal Tar, Naphtha and Xylol Order, 1942, dated Dec. 7, 1942, and operative from Dec. 21. Carbolic acid, 60's, naphthalene, and anthracene controlled by the Coal Tar Products Prices Order S. R. & O. 2509, dated Dec. 7, 1942, and operative from Jan. 1, 1943. Filtered heavy oil (min. gr. 1,080), 7¼d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5½d.; timber preservation and other purposes 4¾d. to 6d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Mar. 13.

Deliveries are substantial. Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6¼d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6d. to 6½d.; hydrogenation oil, 5⅞d. per gallon; all *ex* Works in bulk. Refined cresylic acid is in good call at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. per gallon. Solvent naphtha: Basic prices delivered in bulk, 90/160 grade 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

It being London's "Wings for Victory" Week, stock markets remained subdued throughout the whole of the period, although the tone, except perhaps in the gilt-edged market, remained steady. Rand gold-mining shares were again the chief feature. The Gas Market was no exception to the general rule and business was very quiet, but the few price changes in the Official List were all in an upward direction, although on the Provincial Exchanges it will be seen that Newcastle units closed a shade lower. There is still very little ordinary stock on offer, although a few parcels of debenture stock to yield 4% to 4⅜% are noted in the lists of stock available.

The following price changes occurred during the week:

PROVINCIAL EXCHANGES

Bath Cons. (*x.d.*)	100—103	Mar. 1	
Blyth Ord.	109—111	+6½	
Bristol Ord.	109—111	+1	
Hartlepool Ord.	83—85	—1	
Newcastle Units	22/9—23/3	—/3d.	

OFFICIAL LIST

Brighton Cons....	80—85	+3	
Gas Consolidation "B" Ord. ...	17/3—18/3	+/3d.	
Gas Light & Coke 3½ p.c. max. ...	65—68	+1	
Ditto 3½ p.c. Red. Deb. (*x.d.*) ...	93—96	Mar. 8	
Imperial Continental Ord.	77—82	+1	
Primitiva Holdings, Ltd.	13/—15/—	+1/—	
Severn Valley 4½ p.c. Cum. Pref. (*x.d.*)	17/6—19/6	Mar. 8	
South Metropolitan 4 p.c. Pref. ...	89—94	+1	
Tottenham 5 p.c. Pref.	100—105	+3	
United Kingdom Gas Corporation 4 p.c. 1st Red. Cum. Pref. ...	18/6—20/6	—/6d.	

SUPPLEMENTARY LIST

Cheltenham 5 p.c. Ord.	95—100	Mar. 8	

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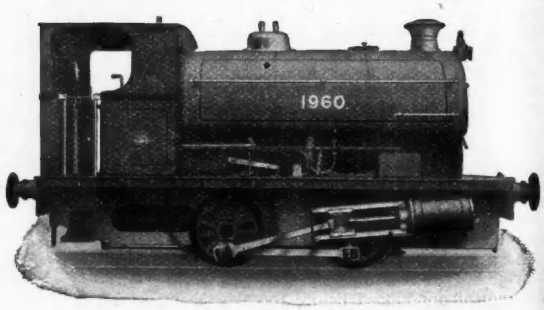
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